QUANTITATIVE RESOURCE ALLOCATION MECHANISMS: EXPERIMENTAL ANALYSES

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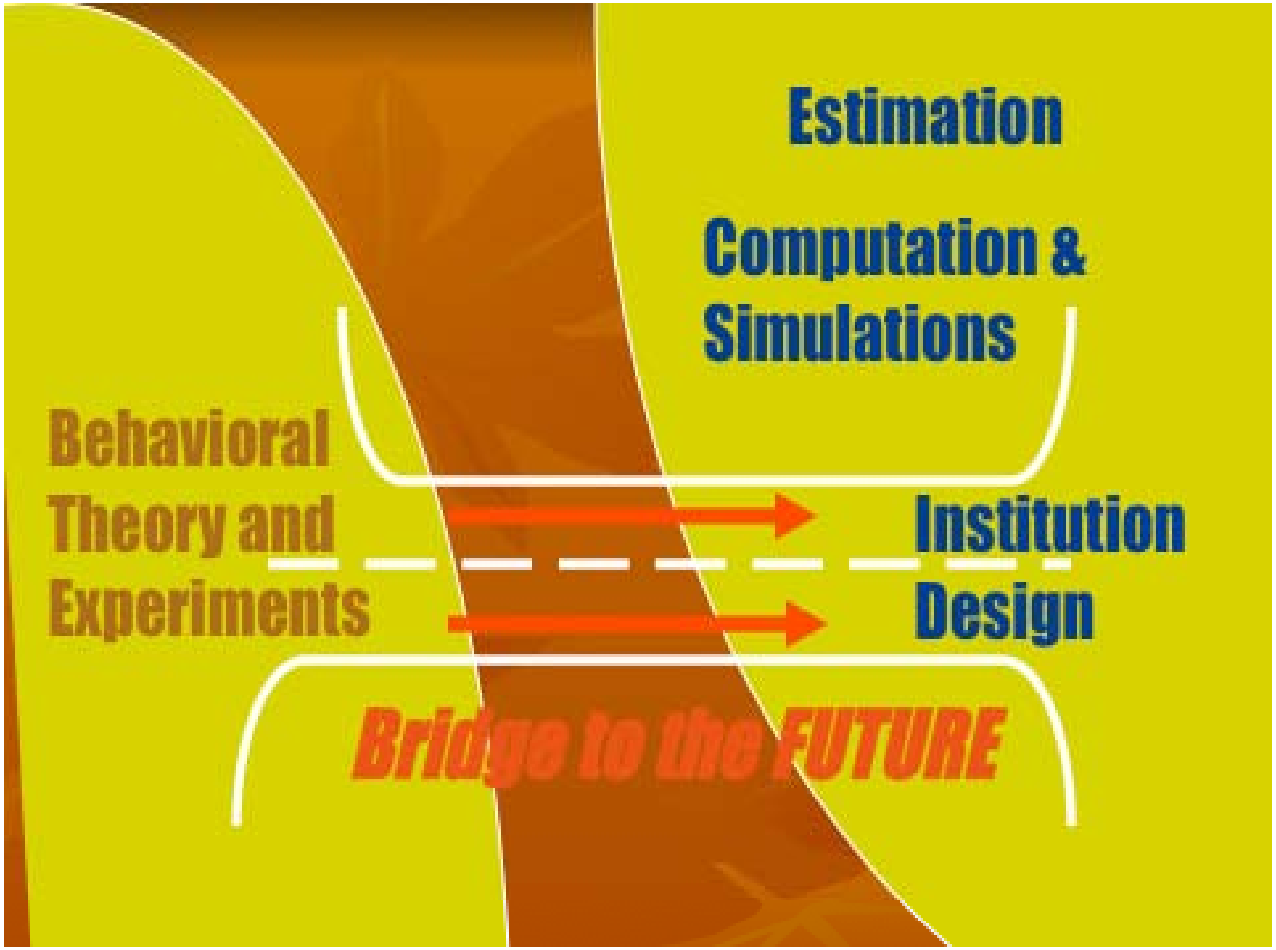
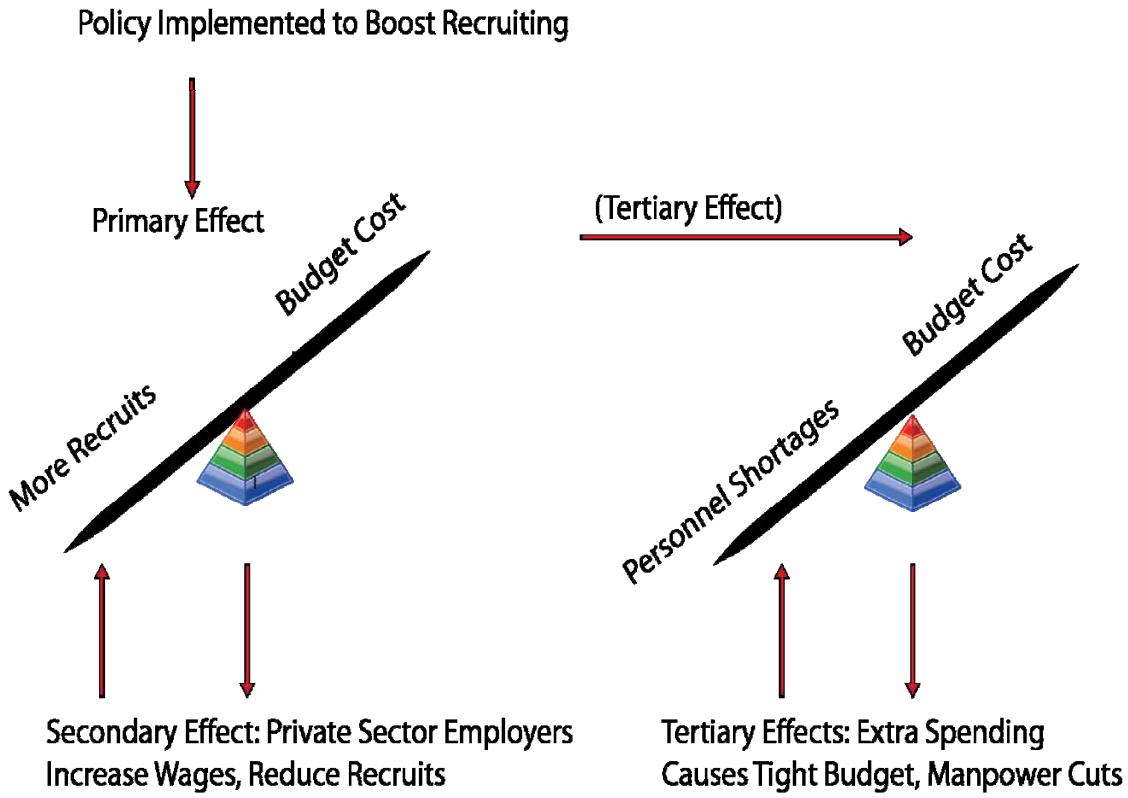
Experiments:
A Key to Institution Design



Why experiment?



Hypothetical: Policy Intended to Boost Recruiting Causes Manpower Costs to Rise Without Gains in Recruiting and Isolated Spot Shortages of Personnel

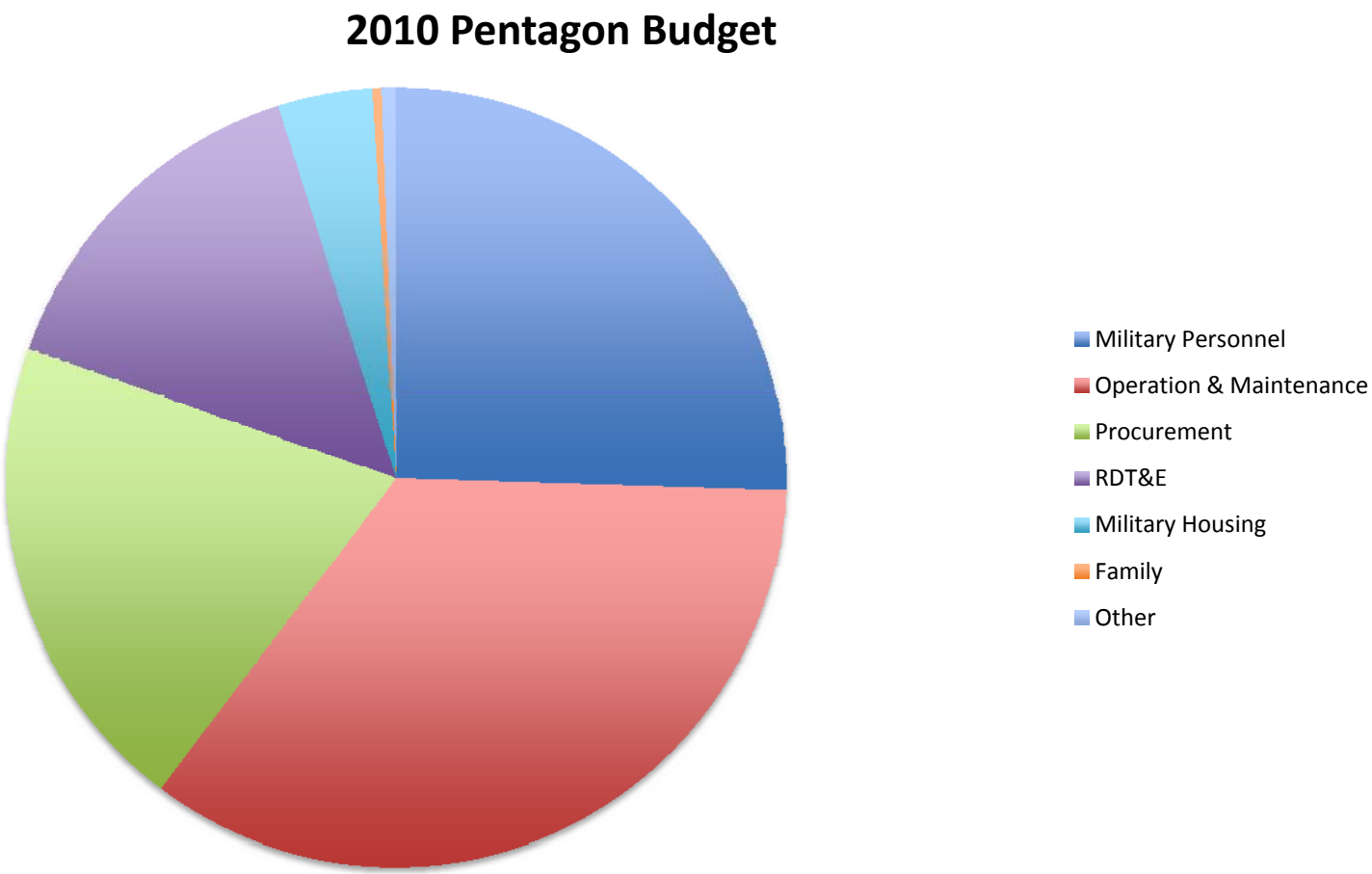
Practical Applications of Experimental Markets

- At ICES, we have used experimental markets to model:
  - Electricity
  - Health care
  - Fisheries
  - Water markets
  - Natural gas
  - Labor Markets

THE NPRST "RAILS" PROJECT:

QUANTITATIVE INVESTIGATIONS OF RECRUITMENT AND RETENTION POLICIES

FY'10 Budget: $133B for Personnel Costs



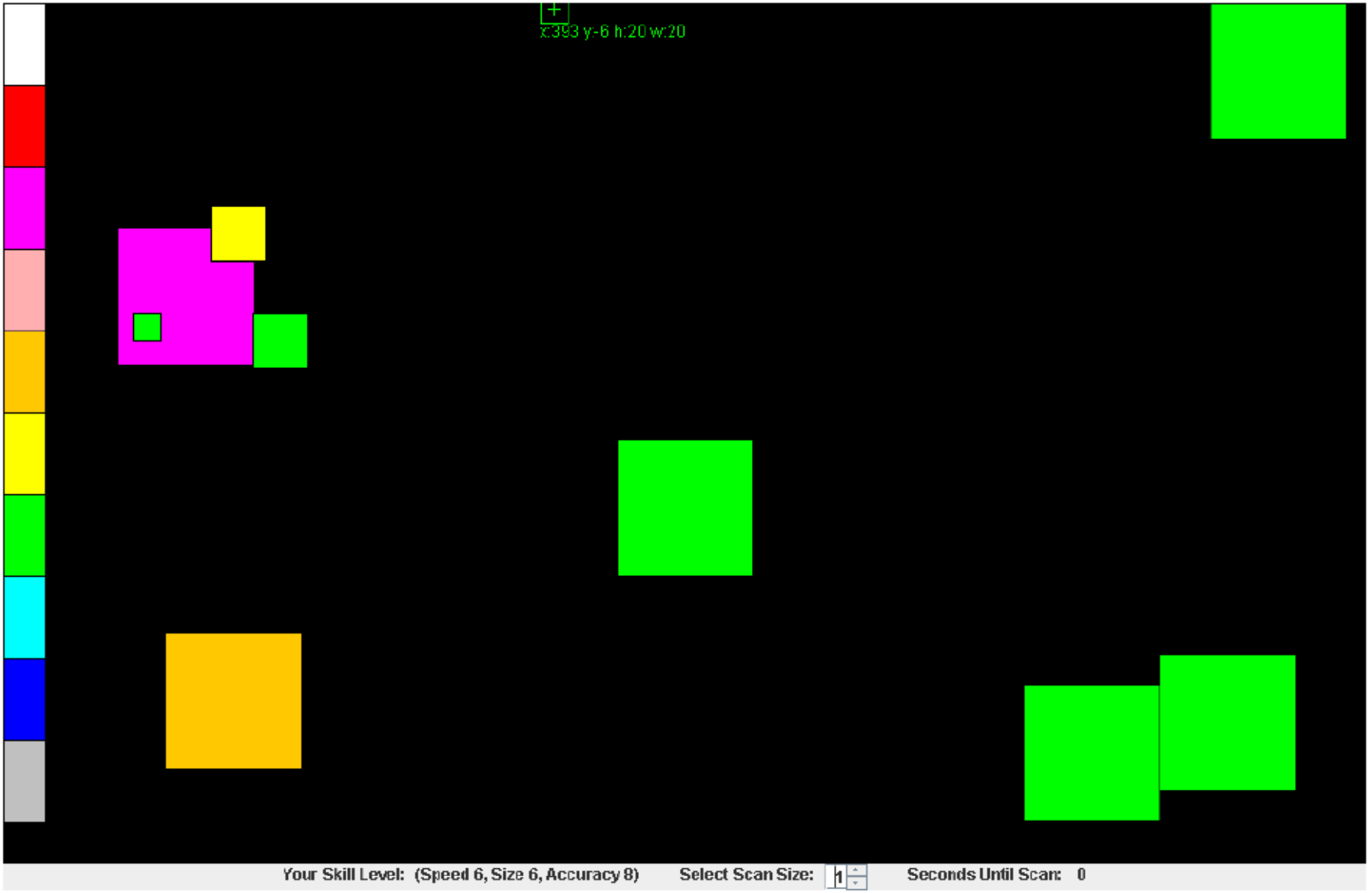
Maybe More …

Line Item	Agency	Amount (billion)
1. Active Association Direct Costs		
Military pay	DoD	$117.6
Retirement benefits	DoD	23.7
Retiree health benefits	DoD	10.7
Miscellaneous benefits	DoD	13.1
Defense Health Program	DoD	28.0
2. Passive Association with Military		
Military health care	DoD/VA	21.0
VA entitlements	VA	56.9
3. Indirect Personnel Costs		
Single housing	DoD	1.8
Family support	DoD	9.2
Transportation	DoD	11.8
Subsistence of persons	DoD	1.2
Communications/utilities	DoD	6.2
	TOTAL	**$301.1**

Source: Jim Arkedis, Progressive Policy Institute memo 11/2009

Key Design Requirements

- Real work environment
- Team and individual production
- Mimic dynamics of competitive recruiting environment, including competition with civilian sector
- Heterogeneous human skills
- Flexible decision architectures
- Ability to nest the environment within different pension schemes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Your Skill Level: (Speed 6, Size 6, Accuracy 8)
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Seconds Until Scan: 0

Commander Job Posting Screen

Current Manpower						
Staff	Skill			Wage	Score %	Periods Left
25	1	2	1	15	0	1
9	3	3	4	28	0	1
11	4	3	5	32	0	1
21	5	6	7	47	29	1

Postings						
Position	Minimum Skill			Wage	Bonus	Duration
2	2/9	2/10	2/9	24/76	0/0	Actual/Target
1	1	1	1	12	0	1
2	1	1	1	12	0	1

Available Personnel				
Staff	Skill			Score
4	2	2	1	0
6	2	3	2	0
8	3	3	3	0
10	3	4	4	0
12	4	5	4	0
16	5	5	5	29
18	6	5	6	0
22	5	6	7	29

Post Reset

Commander Ranking Screen

Position 11		5	5	6		
Rank	Staff	Skill Required			Score	Team Score
	18	6	5	6	0	0
	22	5	6	7	15	0

Reset Ranks

Position 12		4	5	3		
Rank	Staff	Skill Required			Score	Team Score
	12	4	5	4	0	0
	16	5	5	5	15	0
	18	6	5	6	0	0
	22	5	6	7	15	0

Reset Ranks Submit Ranks

Sailor Ranking Screen

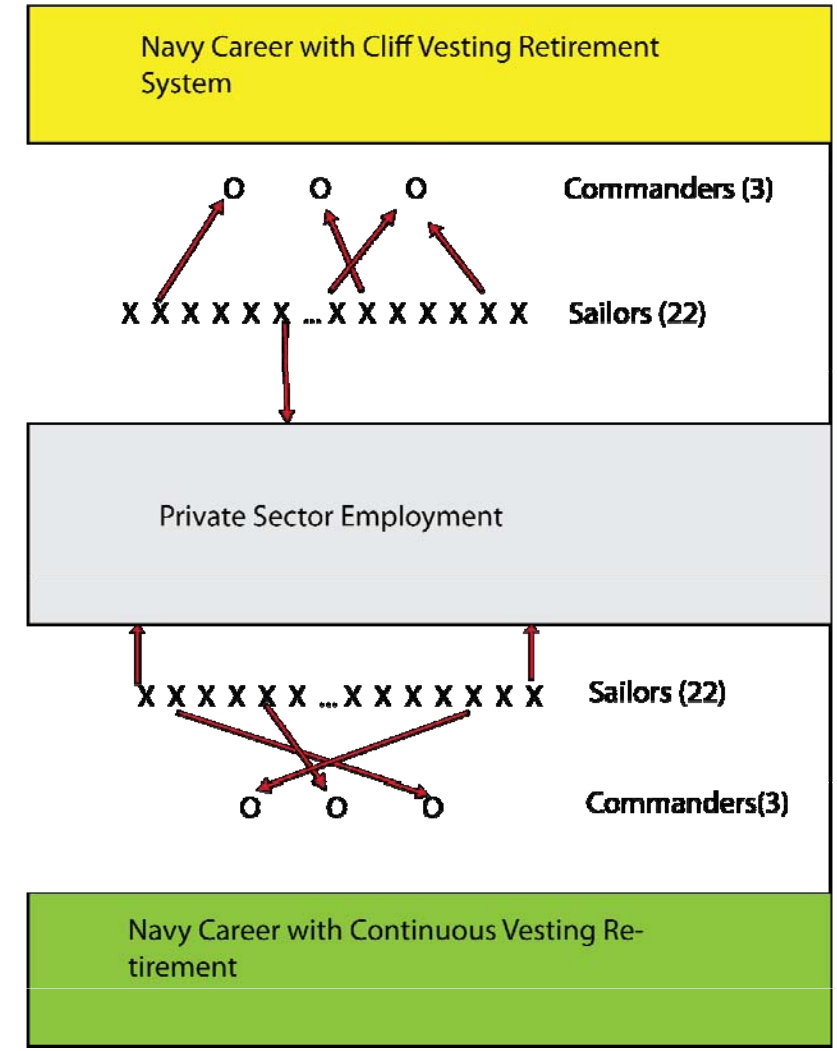
Job Postings											
			Current Skill:		6	5	6				
Rank	Location	Adjustment	Bonus	Score	Skill Required			Skill Improvement			Duration
	A	-10	0	31	5	5	6	1	0	1	2
	A	-10	0	31	4	5	3	1	0	1	2
	B	-20	0	0	1	1	1	1	0	1	2
	C	0	0	0	1	1	1	1	1	0	2
	B	-20	0	0	1	1	1	0	1	1	2
	B	-20	0	0	1	1	1	1	0	1	2
	C	0	0	0	1	1	1	1	1	0	2
	C	0	0	0	1	1	1	0	1	1	2

Reset Ranks | Submit Ranks

Periods to Pension	5
Navy Pension	0
Periods to Retirement	5
Navy Wage	67
Civilian Wage	(50 + 67) x 88% = 102

Quit The Team!

Cliff Vesting Versus Continuous Vesting Scenarios in NPRST Rails



“Wind Tunneling” Algorithms

- Current software uses well-studied “Greedy Algorithm”
  - Similar to professional sports draft model
  - Each commander takes turns selecting best pick until all candidates are matched.
- Many other algorithms are possible and can be implemented easily in this environment

What We Measure At Each Match

1. id
2. treatment ID
3. PeriodID
4. JobID
5. ShipID
6. SubjectID
7. SailorRatingForJob
8. SailorPreferenceForJob
9. SailorRankofJobID
10. CommanderRatingforSailor
11. Sailor0Skill1
12. Sailor0Skill2
13. Sailor0Skill3
14. Commander RequirementSkill1Ship
15. Commander RequirementSkill2Ship
16. Commander RequirementSkill3Ship
17. ShipSkill1Requirement
18. ShipSkill2Requirement
19. ShipSkill3Requirement
20. Commander RequirementSkill1Billet
21. Commander RequirementSkill2Billet
22. Commander RequirementSkill3Billet
23. Skill1Deficit/Surplus
24. Skill2Deficit/Surplus
25. Skill3Deficit/Surplus
26. Skill1Improvement
27. Skill2Improvement
28. Skill3Improvement
29. SalaryPostedJobID
30. SalaryPaid
31. BonusPaid
32. adjustment
33. pension
34. civilianBasePay
35. perfRating
36. balance
37. careerBalance
38. totalWage(ship)
39. postedWage(ship)
40. Manpower(ship)
41. actualWage(ship)
42. bonusPool(ship)
43. bonusPost(ship)
44. bonusPaid(ship)
45. positions(ship)
46. earnings(ship)
47. CurrentValueofPension
48. PerfRatingofSailor
49. PerfRatingofShip
50. AssignmentExpiresInPeriodX
51. CivilianBasePay
52. BudgetShip
53. BudgetNavy
54. BonusShip
55. CommanderCompensation
56. CommanderBonus
57. NavyReadinessScore

Let's Experiment!

- The NPRST_Rails team completed development of software, interfaces, databases, and communications for an initial study of two alternative types of retirement compensation for Navy personnel: continuous, versus "Cliff" vesting of pensions.
- We look forward to continuing this initiative!

What other questions we can explore?

- Virtually any kind of initiative can be modeled in an experimental market.
  - RAILS offers the communications and data processing capabilities to manage the transactions.
  - RAILS allows us to look at a wide variety of behavioral characteristics, measure the characteristics, assign weights to the most/least desirable and apply them to assignment decisions and experiment with effects.
  - Experiments with RAILS help us to discover causal effects

Thank You!